Renals

- Renal functions:- Regulatory, secretory and excretory.
- Kedny secretes:- 1 Erythropoiten 2 Renin 3 1.25 dihidroxy Vit D3
- Kedneys are a site of gluconeogenesis in case of prolonged fasting.
- Non-protein nitrogenous compounds are formed by metabolic degeneration of nuclic acids and protein.
- KFT most be used by creatinin .... as the level of urea is changeable according to the level of protein in diet.

Non-protein nitrogenous (NPN)

- Urea
  - PTH catabolism and detoxification "Removal of NH_3"
  - formation of NH_3
  - urea "75%"
  - Level is changeable
  - usefull in KFT
- Creatinin
  - Creatin + ATP
  - ionized "Na-unstable"
  - PH below 5 unstable
  - 2% of total muscle creatine
  - 1-2% from original Phosphate is excreted
- Creatin-P
  - $ADP + H$
  - PH above 5.7 unstable
  - unionized "soluble"
  - unoissociated
  - Calculi
- Uric acid
  - end product of purine "A, G"

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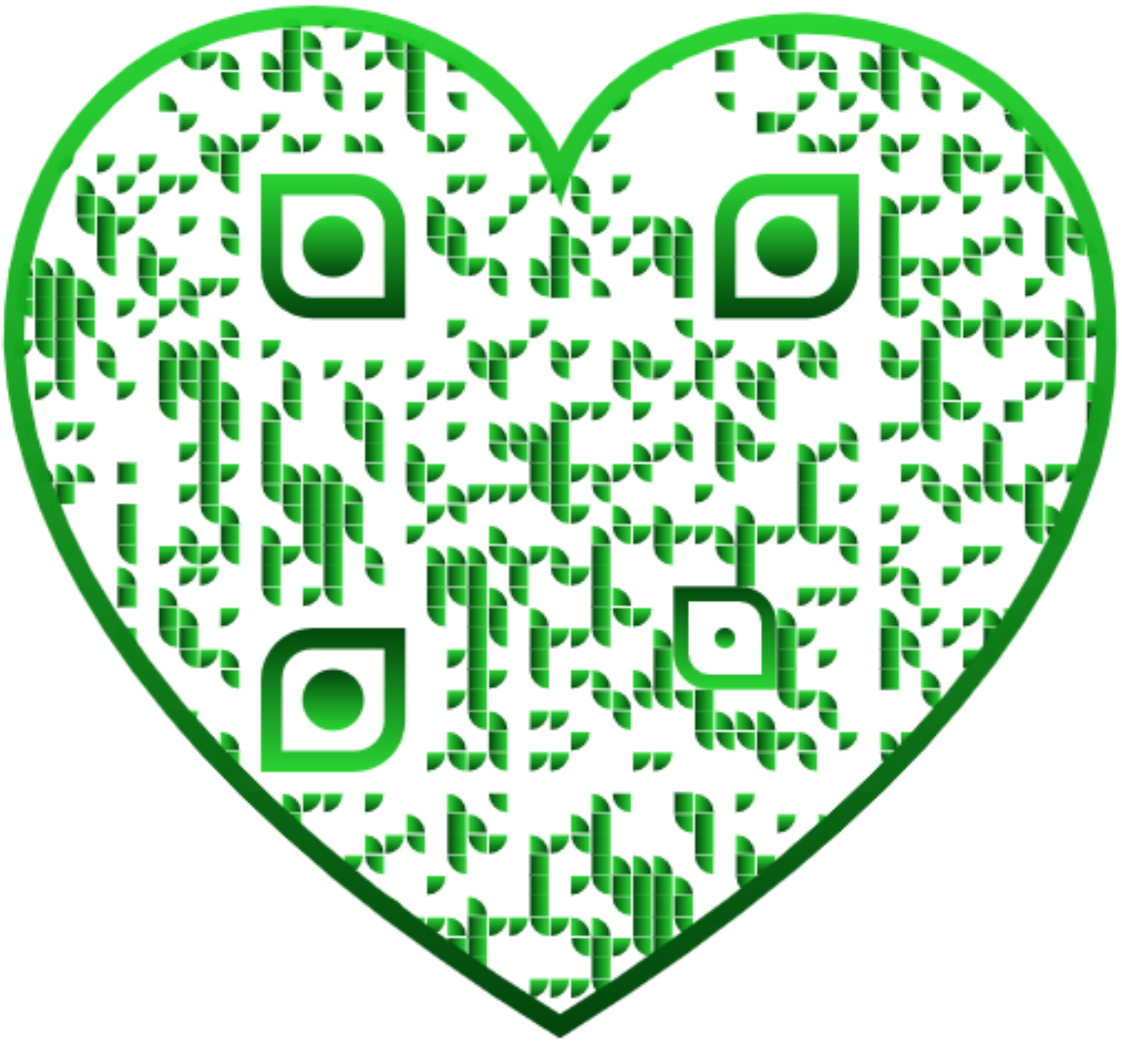

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Composition of Body fluid

ECF

- Cation → Na^+
  - ↓ contraction
  - ↓ impulse transmision.
  - ↓ Fluid, electrolyte balance.
- anion → Cl^-
  - ~~Resting mem. P.~~
  - Regulate osmo. P
  - HCl in stomach

ICF

- anion → K^+
  - Ref. mem. P
  - Action P.
  - ↓ maintain Intracellular Volume.
  - Regulate PH.
- cation + Ptn-Poc

- Most plasma membranes contain Cl^- leakage channels and therefor it pass easily between both ECF, ICF ∴ Cl^- Shift ∴ → maintain Correct balance of anions between ECF and ICF.
- (PTH) → Proximal reabsorption of phosphate → equal in ECF, ICF either bind to Ptn or not bind to Ptn.

- Ca^{+2} 2nd most abundant IC cation and most important inorganic ~~cation~~ messenger in ~~the~~ Cell → Regulated by both PTH and Calcitonin on → Gut, Bone and Renal tubes.

- Mg^{+2} intracellular cation ... enzymatic Co-factor — Ptn bound or free.
  - Free Mg^{+2} is easiely filtered in glomerulus and reabsorbed in the Proximal convuluted ↓ under effect of PTH.

- Respiratory system and acid-base buffering system are the main Gratigies in Acid/Base regulation ... Kedney share by regeneration of HCO_3 and removal of metabolic acids.

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Endocrinal function

Primary

Hormones secreted by Kedny

1. Prostaglandin « PGA_2, PGE_2, PGI_2 and PG_{12} » --- direvitves of unsaturated aracludonic acid --- act like hormones and differ in that the site of synthesis is the site of action. --- ↑ Renal blood flow, H_2O and Na excretion and renin release --- act to oppose V.C and used in treatment of hypertention.
2. Erythropoitin « in response to hypoxia » « Oxegin level »
   - ↑ RBC Count.
   - Incase of CRF, Erythropoiton is significantly reduced.

Indry

- hormones act on Kedny.
  1. Aldosteron.
  2. Catabolism of insulin, glocagon and aldosteron.
  3. Activation of V.t D_3

CRF → osteomalacia

- GFR in adult is 110 ml/minute ... depends on: Net pressure, surface of membrane and Nature of membrane.
- substances used to measure GFR:
  1. Inuline .... I.V adminstration « not endogenous » ... not suitable for rotine testes.
  2. Creatinin clearance : endogenous -- Conc. is related to made in diet.
  3. Radiolabled edita - clearance .... Rarely used.
  4. Urea Clearance --- Not used any more.
- 40-60% of urea ~~Clearide~~ is reabsorbed .. provide a source of energy ... The quantity vary according to diet.

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follow

- Creatine is produced by liver, Kidney and Pancreas and transported to other sites of body.... unlike urea, Creatinin is not reabsorbed by renal tubules.

- Tubular function :-

- Healthy Kidney has capasity of :- Reabsorbing H_2O and excreting H^+.

- Assessment of renal tubular functions is by :- Renal Con. test, urinary acidification

1 Renal Concentration test :-

- Kidney loses capacity of concentrating urine incase of falling in GFR « ↑↑ Plasma Creatinin » ... methods of assessment of Renal Concentration include :-

A Measurement of urinary sp.ecific gravity .... early morning ... ↑↑ sp. Gravity incase :- Dehydration, Proteinurea, Glycosurea

B Urinary osmolality test :- The correct test as it is directly proportional to the osmotic work of Kidney = sp. Gravity but it does not ↑↑ in case of Proteinurea and Glycosurea.

C Fluid deprevition :- ... no drink since 22.00h .... sample collect at 8 Am.

2 Urinary acidification test :-

Acidification is a result of reabsorbing of (NCO_3) and excretion of $[H^+]$ ⟶ $[H^+]$ of urin is higher than that of blood.

... administration of NH_4Cl after overnight fasting ... sample Collected « urine & blood » hourly intervals until 18.00h ... Blood sample PH and T-Co_2 is analysed and urine PH is measured

follow :-

- Renal diseases :-

1 Acute renal failure :-

- Acute onset severe enough to cause failure of renal homeostasis.
- ↓ GFR ⟶ oligourea in most patients « not all of them ».

2 Phases

oligouric phase

- urin volume < 400 ml / day
- dignosis :- 1 ↓ Na^+ in blood
2 ↑ K^+ in blood
3 Retention of [urea, creatinin, sulphate]

Diuretic Phase

- urin volume ↑↑
dignosis :- 1 loss of Na^+ and K^+ ... have to be corrected
2 Plasma creatinin, urea and sulphate continue to ↑↑

2 Chronic Renal failure [CRF] :-

- dignosis :- 1 Reduction of GFR associated with retention of waste products « urea - creatinin and Phosphate » in Plasma.
2 Na^+ and H_2O depletion.
3 hyperKalemia.
4 Metabolic acidosis ... due to ↓ Renal capacity to form NH_4
5 Plasma Ca^{+2} ↓ while Plasma Phosphate ↑.

- N.B :- CRF ⟶ 2ndry hyperparathyroidism in which :- ↓↓ Ca^{+2} ⟶ ↓ 25 DHCC ⟶ Osteomalacia

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3 Proteinuria:-

- Normally ≈ 30 mg/L ... early morning samples.

Causes of proteinuria

Orthostatic	Glomerular	Tubular
- Benign condition affecting both children and young.	- Comenest → presistant Proteinuria ... usually due to damage of ~~Proteinuren~~ Glumerulo'	- Renal tubules fail to reabsorb Plasma Prn - due to tubular damage.

4 Renal stone:-

- may → reduce renal functions ... can be prevented by inhibiting substances present in urine.

Types:-

Ca. Oxalate "hypercalciuria" ... Mg. Amm. phosphate "UTI" ... Uric acid "Gout and high Protein in diet" ... Cystine "cystinuria" ... Xanthine "Xanthinuria" ...

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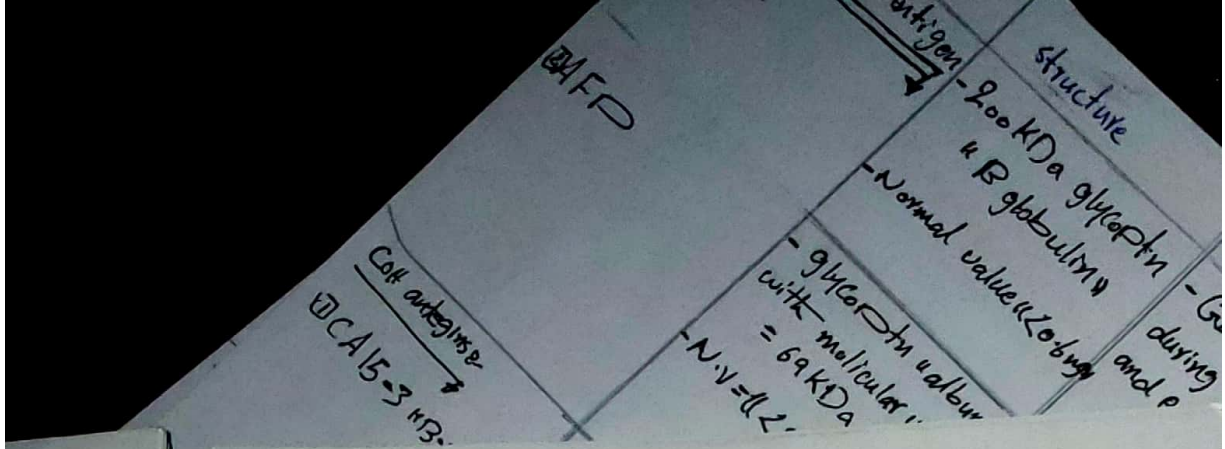

- urine analysis -
- importance -

1. detect disease which pass unnoticed « D.M - stones - UTI »
2. diagnosis of many renal diseases « Nephrotic syndrome, acute renal failure and myloma »

- urine composition: 1-1.5 L

1. 95% ⟶ H_2O
2. 5% ⟶ solids « end products of metabolism »

- Formed elements « cells, casts, crystals, mucus, bactorian may be formed in urine.

- N.B: GFR = 125 / minute « 180 Liter / day »

- urine formation:

1. Filteration:
- 20% of body fluid are filtered « filteration fraction » --- 99% of filteration fraction are reabsorped.
- 200 L ⟶ filterate .... 1-2 L ⟶ urine .... 198-199 L ⟶ Reabs
2. Reabsorption: « mainly in proximal tubules »
- 99% of H_2O .... passively -
- Glucose is absorped actively - - - in proxim.T .... according to renal Threshold.
- Na^+ .... actively according to diet.
3. secretion: either actively or by diffusion.
- H^+, K^+ and amonnia

- Control of urine excretion:

1. ADH
2. Aldosterone -

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- changes of non preserved specimen:

1. Transformation of urea to ammonea «by urease» → ↑ PH.
2. ↓ G due to glycolysis by bacteria.
3. ↓ Ketones because of volitilization.
4. ↓ bilirubin «due to exposure to light».
5. ↑ Bacterial number «growth».
6. ↑ Turbidity «caused by bacteria and amorphus».
7. Disintegration of RBCs and Casts.
8. ↑ Nitrite «Nitrate $\xrightarrow{\text{bacteral reduction}}$ Nitrite.
9. Change the color.

- types of specimen:

- Random --- First morning .... 24's collection --- Post. Prandial
clean catch «midstream» .... Catheterized urine .... suprabubic.

- urine analysis:-

1. Physical examination:

1. Color:- «Proportional to Concentration» --- varus pegments ....
Yellow or Amber color are related to urochrome.

2. Turbidity:- «cloudness» .... depends in both plt and solids ...
Turbidity due to bacteria smook appearance may be seen
in hematouria

2. Volume:- «750 ml - 2000 ml / day»
- ↓ Indicate balance bet. H2O intake and H2O lost by urine, sweat glands, intestine and lungs.

3. Clarity:- «Transparency ... any turbidity indicates:-
WBC's Pus --- RBC, epithelium, Bacteria, Casts, Crystals,
Lymph and Semen.

follow:-

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4. Specific gravity:- «hydration / dehydration marker».
- indecates the fluid densety which depends on solid Concent
- Normal SG:- 1.005 - 1.030 .... diluted SG:- 1.000 - 1.010
.... Concentrated = 1.025 - 1.03.

5. PH:- must be in early morning .... Acidic «4.5 - 8».
- Acidity indicates:- D.M and Renal tubular acidosis.
- Acidity reflect excretion of nonvolatile metabolic acids «Lactic, Pyrovic acids and Citrate».

6. Odor:- Normally → Aromatic «due to voliate acid».
- Pathological odors:- 1. Fruty «due to Acetone» → diabitic odor
2. Ammoniac «due to long standing urine» -- 3. Offensive «bacte
actions» → UTI ... 4. Mousy odor «Phenyle alanine →
Phenyle Ketonuria» PKU

2. Chemical examination:-

1. G and Ketone bodies:- G → D.M - K.b → D.M & starvati
2. Protein:- incase of Glumerular nephritis.
3. Nitrite:- indicate bacteria in urine «UTI».
4. Billirobine:- ↑ in viral hepatitis, obstrictive jaundice, Gilbert's d
5. Blood, Hb:- Renal trama, infections and calculi.

3. Sedimentation examination:-

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